

Listing of Claims



1. (original) A method for controlling speed of an engine having at least one cylinder, the engine also having an intake manifold and an outlet control device for controlling flow from the intake manifold into the cylinder, comprising:

generating a desired engine speed; and

changing the outlet control device to control the engine speed to said desired engine speed.

2. (original)The method recited in Claim 1 wherein the engine further comprises an inlet control device for controlling flow into the intake manifold, wherein said changing step further comprises changing both said inlet control device and the outlet control device in response to a respective outlet control device command and an inlet control device command.

3. (original)The method recited in Claim 2 wherein said changing step further comprises the steps of:

determining said outlet control device command based on a difference between said desired engine speed and the engine speed; and

determining said inlet control device command based on said difference.

4-5. (cancelled)

6. (original)The method recited in Claim 2 wherein said inlet control device is a throttle and the outlet control device is a variable cam timing actuator.

7. (original) A method for controlling speed of an engine having at least one cylinder, the engine also having an intake manifold and an outlet control device for controlling flow from the intake manifold into the cylinder and an inlet control device for controlling flow into the intake manifold, comprising:

generating a desired engine speed; and

changing both the outlet control device and the inlet control device based on the engine speed and said desired engine speed and in response to a respective outlet control device command and an inlet control device command.

8. (cancelled)

9. (original) The method recited in Claim 7 wherein said changing step further comprises the steps of:

determining an engine speed error between said desired engine speed and the engine speed;

determining a desired cylinder charge based on said engine speed error; and

determining said inlet control device command and said outlet control device command based on said desired cylinder charge.

10. (original) The method recited in Claim 9 wherein said inlet control device is a throttle.

11. (original) The method recited in Claim 9 wherein said outlet control device is a variable cam timing actuator.

12. (original) The method recited in Claim 9 wherein said outlet control device is a swirl control valve.

13. (original) The method recited in Claim 9 wherein said inlet control device is an idle air bypass valve.

14. (original) The method recited in Claim 7 wherein said inlet control device and said outlet control device are changed to affect flow in similar directions to control engine speed.

15-19. (cancelled)

20. (new) A method for controlling an engine airflow, the engine having at least one cylinder, the engine also having an intake manifold and an outlet control device for controlling flow from the intake manifold into the cylinder, the outlet control device including variable valve lift, the engine having an exhaust system with a three-way catalytic converter and exhaust gas oxygen sensor, the method comprising:

generating a desired engine speed;

changing valve lift to control the engine speed to said desired engine speed;

directly injecting fuel into the cylinder based on a signal from the sensor to maintain average air/fuel at stoichiometry.

21. (new) The method of claim 20 wherein the sensor is located upstream of the three-way catalyst.

22. (new) The method of claim 20 wherein the engine also has an electronic throttle coupled to said intake manifold, the method further comprising adjusting said throttle based on an operating condition.

23. (new) The method of claim 20 wherein said adjusting further comprises adjusting valve lift based on an error between said engine speed and determined engine speed.

24. (new) The method of claim 20 wherein the engine is a v-type dual bank engine.

25. (new) The method of claim 20 wherein said directly injecting fuel further comprises directly injecting fuel into the cylinder during the intake stroke so that a substantially homogeneous air/fuel mixture is formed.

26. (new) A system for an engine with intake manifold comprising:

- an outlet control device controlling flow exiting the manifold and entering the engine, said outlet control device including variable valve lift;

- an inlet control device controlling flow entering the manifold, said inlet control device including an electronically controlled throttle plate;

- a fuel injector coupled to a cylinder of the engine capable of directly injecting fuel into the cylinder (during an intake stroke to form a homogenous air-fuel mixture);

- an oxygen sensor coupled in an exhaust of the engine;

and

- a controller determining a desired engine speed, adjusting said outlet control device to provide said desired engine speed, adjusting said inlet control device based on an operating parameter, and adjusting fuel injected into the engine based on said oxygen sensor.

27. (new) The system of claim 26 further comprising a three-way catalyst coupled in said exhaust.

28. (new) The system of claim 27 wherein said sensor is located upstream of said three-way catalyst.

29. (new) The system of claim 26 wherein said controller further adjusts said inlet control device based on an error between said desired engine speed and a determined engine speed.

30. (new) The system of claim 26 wherein the engine is a v-type dual bank engine.

31. (new) The system of claim 26 wherein said controller directly injects fuel into the cylinder during the intake stroke so that a substantially homogeneous air/fuel mixture is formed during a stoichiometric mode of operation.

32. (new) The system of claim 26 wherein said controller adjusts fuel injected directly into the engine via said fuel injector based on said oxygen sensor to maintain a stoichiometric air-fuel ratio.

33. (new) A system for an engine with intake manifold comprising:

- an outlet control device controlling flow exiting the manifold and entering the engine, said outlet control device including variable valve lift;

- an inlet control device controlling flow entering the manifold, said inlet control device including an electronically controlled throttle plate;

- a fuel injector coupled to a cylinder of the engine capable of directly injecting fuel into the cylinder during an intake stroke to form a homogenous air-fuel mixture;

- an oxygen sensor coupled in an exhaust of the engine;

a three-way catalyst converter coupled in said exhaust;
and

a controller determining a desired engine speed,
adjusting said outlet control device to provide said desired
engine speed, adjusting said inlet control device based on an
operating parameter, and adjusting fuel injected directly into
the engine via said fuel injector based on said oxygen sensor to
maintain a stoichiometric air-fuel ratio.

34. (new) A method for controlling an engine having at
least one cylinder, the engine coupled to a vehicle, the engine
also having an intake manifold and an outlet control device for
controlling flow from the intake manifold into the cylinder, the
engine further having an inlet control device for controlling
flow into the intake manifold, the outlet control device
including an electronic throttle, the engine also having an
exhaust gas oxygen sensor, the method comprising:

generating a signal representing a request from a
driver;

determining a desired torque based on said request;
in response to said signal and to improve drive feel,
adjusting the outlet control device based on said desired torque;
adjusting throttle position based on an operating
parameter; and

injecting fuel into the engine based on a signal from
the sensor to maintain average air/fuel at stoichiometry.

35. (new) The method of claim 34 wherein the sensor is
located upstream of a three-way catalyst.

36. (new) The method of claim 34 wherein the engine is a v-
type dual bank engine.

37. (new) The method of claim 34 wherein said injecting fuel further comprises directly injecting fuel into the cylinder during the intake stroke so that a substantially homogeneous air/fuel mixture is formed.

38. (new) The method of claim 34 wherein the outlet control device includes variable valve lift.

39. (new) An article of manufacture comprising:
a computer storage medium having a computer program encoded therein for controlling an engine having at least one cylinder, the engine coupled to a vehicle, the engine also having an intake manifold and an outlet control device for controlling flow from the intake manifold into the cylinder, the outlet control device including variable valve lift, the engine further having an inlet control device for controlling flow into the intake manifold, the inlet control device including an electronically controlled throttle, said computer storage medium comprising:

code for generating a signal representing a request from a driver;

code for determining a desired torque based on said request;

code for, in response to said signal and to improve drive feel,

adjusting the outlet control device based on said desired torque;

adjusting throttle position based on an operating parameter; and

code for directly injecting fuel into the engine based on a signal from the sensor to maintain average air/fuel at stoichiometry.